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INSECTICIDE AND FUNGICIDE

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This invention relates to insecticides and fungicides and more particularly to insecticides and fungicides in the form of substantially dry dusts comprising mixtures of gaseous, liquid or solid
5 toxic organic sulfur compounds and an active powdered carrying medium. This invention contemplates the manufacture of an insecticide and fungicide composed essentially of an activated dust carrier and certain groups of organic sulfur compounds.

All crude oils contain some compounds of sulfur which are more or less undesirable insofar as the general commercial use of the refined petroleum products is concerned. During the processes of distillation, cracking and refining these
15 compounds may be altered in chemical constitution, and the synthesis of new organic sulfur compounds may occur. It is desirable to remove these sulfur compounds during the refining processes.

A study of the sulfur compounds contained in petroleum reveals some of them to be highly toxic to insect and fungus life. Among the more toxic sulfur compounds found in petroleum or its derivatives are the mercaptans, the thiophenols and thiocresols, the alkyl sulfides or thio ethers, the disulfides, the thiophenes, the sulfones, the sulfoxides and the sulfonic acids.

These organic sulfur compounds may be separated from petroleum or its derivatives or from the products of the cracking and refining processes by well-known chemical reactions.

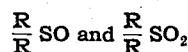
It is known that freshly distilled naphthas contain sulfur compounds of the mercaptan, thiophenol and thiocresol classes, which are readily acted upon by caustic soda. This reagent is usually used in the form of a solution with which the untreated naphthas are washed, and with which the organic sulfur compounds react to form the
40 corresponding sodium salts. By acidification of the separated sodium salts it is possible to bring about their reconversion to the original, corresponding mercaptans, thiophenols and thiocresols.

Disulfides are produced when mercaptans are subjected to the doctor treatment. This consists principally in reacting them with sodium plumbite and sulfur. Recovered mercaptans may in this manner be converted into the corresponding
50 disulfides.

Organic sulfides are present as such in some petroleum distillates and in the products obtained by cracking petroleum, though they may be obtained more readily from the tars and sludges
55 resulting from the sulfuric acid treatment of

these materials. A method that is applicable for this purpose is the formation of double compounds with heavy metal salts.

Sulfones and sulfoxides are compounds which correspond to the formulae



respectively, and usually result when organic sulfides are subjected to oxidizing conditions, as in treating the petroleum sulfides with sodium hypochlorite or sodium peroxide.

Thiophene and sulfonic acids are best obtained by their separation from sulfuric acid tars and sludges. Distillation by means of steam is one method that is useful for this purpose.

Insecticides and fungicides comprising certain organic and inorganic chemicals combined with a dust carrier are widely known and used at the present time. In ordinary commercial practice, such insecticides and fungicides take the form of a dry dust which is used without dilution of any kind in various types of power or hand driven dusting machines. The more finely divided these
25 dusts, the more pronounced are their insecticidal and fungicidal properties. This is due to the greater quantity of insecticidal and fungicidal materials capable of being adsorbed on the increased surface.

Too fine a state of subdivision of the dust carrier, however, results in material losses during the dusting operations caused by the carrier being borne away by air currents. This is an important consideration when the dusting of large areas by
35 airplane is contemplated.

Organic sulfur compounds are readily adsorbed in large quantities by certain otherwise inert materials which have the further characteristic property of tenaciously retaining these compounds and releasing them only very slowly in vapor form. This is a characteristic of such adsorbents as, carefully dehydrated fuller's earths, silica gel, acid-treated clays, activated bauxite and activated charcoals and carbons.

I have found that when organic sulfur compounds recovered from petroleum, from its derivatives or from the products obtained by cracking petroleum are used in conjunction with any of the enumerated adsorbents, a very superior type of insecticide and fungicide results. Much greater quantities of the organic sulfur compounds are capable of admixture without detracting from the substantially dry character of the dust and without having recourse to too high a degree of subdivision. The relative superiority of these in-
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secticides and fungicides may in part be due to the fact that the toxic materials are released over a relatively long period of time assuring a continued toxic condition. A sudden, rapid release of the insecticidal and fungicidal materials, which may have a deleterious effect on the plant life, is thereby likewise averted.

In preparing dust mixtures various methods of incorporating the organic sulfur compound or sulfur compounds with the dust carrier may be used. I prefer to bring about this result by placing a suitable carrier of a mesh which may vary over wide range but preferably of between 200 and 400 mesh in a suitable mixer, such as a ball mill, and slowly adding the organic sulfur compound or sulfur compounds while the dust carrier is being agitated or mixed. The percentage of sulfur compound or sulfur compounds added to the activated carrier during this mixing operation, may vary widely depending on the desired use to which the finished dust is to be put, and accordingly, the average percentage of sulfur compound or sulfur compounds carried in the completed dust mixture will vary widely depending on the intended use. The present invention, therefore is not limited to the use of any specific percentages of these elements with the dust carrier.

I have impregnated activated fuller's earth with very small percentages of representative compounds of several groups of organic sulfur compounds. As an example, a dust composed of 99.8 per cent of fuller's earth of 200 mesh and 0.2 per cent of ethyl mercaptan recovered from petroleum oil was dusted on citrus trees and killed thrips, red spiders, aphids and scale insects in various stages of development.

The disulfides are less toxic than the members of the mercaptan series, from which they are often formed during the refining processes. The toxic relationship for general insect and fungus use is practically the same. While I do not wish to limit myself to the amount of organic sulfur compound carried by the dust medium, I have found

that a mixture of 99.5 per cent of activated fuller's earth of 200 mesh with 0.5 per cent of ethyl disulfide recovered during the refining of petroleum products will kill aphids, scale insects and many species of worms and beetles, as well as grape leaf hopper, spiders and mites.

I claim:

1. An insecticide and fungicide in the form of a substantially dry dust which comprises a finely divided activated adsorbent selected from the group consisting of dehydrated fuller's earth, acid-treated clay and silica gel impregnated with readily vaporizable organic sulfur compounds recoverable from petroleum and the products of refining the same selected from the group consisting of mercaptans and organic disulfides.

2. An insecticide and fungicide in the form of a substantially dry dust comprising a finely divided activated adsorbent selected from the group consisting of dehydrated fuller's earth, acid-treated clay and silica gel impregnated with readily vaporizable mercaptan compounds recoverable from petroleum and the products of refining the same.

3. An insecticide and fungicide in the form of a substantially dry dust comprising a finely divided activated adsorbent selected from the group consisting of dehydrated fuller's earth, acid-treated clay and silica gel impregnated with organic disulfides recoverable from petroleum and the products of refining the same.

4. An insecticide and fungicide in the form of a substantially dry dust consisting of finely divided dehydrated fuller's earth impregnated with readily vaporizable mercaptans recoverable from petroleum and the products of refining the same.

5. An insecticide and fungicide in the form of a substantially dry dust consisting of finely divided dehydrated fuller's earth impregnated with readily vaporizable organic disulfides recoverable from petroleum and the products of refining the same.

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